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INTRODUCTORY REMARKS.

JOINT MEETING OF BRITISH EDUCATIONAL MISSION TO THE UNITED STATES AND THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS., DECEMBER, 6-7, 1918.

President John F. Hayford: The meeting will please come to order. I ought to tell you, perhaps, at the outset that this

meeting was called at the request of the Committee on International Relations of the American Council on Education; the meeting was called at the request of that committee.

It was called as a joint meeting of the British Educational Commission and the Society for the Promotion of Engineering Education. The committee also selected the three topics which you find on the program as the topics of the meeting; the dates were also selected by that committee—all the preliminary arrangements, in other words.

I believe the first thing on our program is the address of welcome by Dr. R. C. MacLaurin, President of the Massachusetts Institute of Technology, Dr. MacLaurin.

ADDRESS OF WELCOME ON BEHALF OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

BY PRESIDENT R. C. MACLAURIN.

Mr. President, Ladies and Gentlemen: It is a pleasure on the part of the Institute to welcome such a gathering as this at any time, but particularly under the circumstances of the place and time.

We are here to welcome the British Educational Mission, and we welcome them while we are looking out on the Charles River, named in honor of an English king who, among his other accomplishments, helped to form the Royal Society, the society which did so much for all the fundamental sciences in which all real engineers are so vitally interested. Of course we are in the city of Cambridge, which carries with it all the associations which cluster around Harvard University.

It is with extreme pleasure we welcome you to this institution, which is bound by a thousand ties to engineering institutions all over this country and in Great Britain; and if the place is propitious the time is especially so. We are practically at the end of a great war and at the beginning of a new period of history; a great war that has demonstrated more dramatically than anything else could have demonstrated the enormous importance of applied science in all the activities of life, and has brought home to everybody the fact that in peace as well as in war the very existence of nations will depend upon the extent to which they realize the usefulness of science.

The problems of engineering education which you are going to discuss are, in a certain sense, new problems, because the world is, in a certain sense, new; but I for one will be surprised if they do not prove to be rather old problems, because the matters usually discussed at all these meetings are always

old—the old question, for example, of how to deepen and broaden the training of an engineer.

As the years roll by we all appreciate the increased importance of his education, and always there is the call for the broader man and the deeper man in the engineering profession, and how to make him broader and deeper is the root problem. And there is always the same divergence of view and the same concurrence of view on certain matters regarding the fundamental problems; and these problems are really similar in all parts of the world, so that I confidently expect that what our honored guests from Great Britain will tell us will be directly applicable to our conditions here.

Unfortunately, as I have just learned, they are to leave the city tomorrow morning, and that necessitates a change of the program and calls for the utmost brevity in introductory remarks; so without trespassing further in that direction I offer to you in the name of the Massachusetts Institute of Technology a most cordial welcome to the British Mission and to this Society for the Promotion of Engineering Education.

ADDRESS OF WELCOME ON BEHALF OF THE SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION.

BY JOHN F. HAYFORD, PRESIDENT.

According to the printed program it now falls to me as president of the Society for the Promotion of Engineering Education to express to our friends from Europe the welcome of that society. That is a welcome then to representatives of higher education—all forms of higher education in Great Britain from the representatives of engineering education in the United States.

We welcome our British friends as brothers—if not brothers, at least they are the descendents of certain brothers who decided some years ago to stay at the old homestead in England, and we are the descendents of brothers who tried the experiment of planting British ideas of a new sort. And to you members of the Great Britain branch we extend a welcome; we are glad to exchange ideas with you; we put forth our ideas with confidence, because we feel that if you find in our ideas anything good you will credit it to us. If you find in our ideas anything which you cannot approve, we depend on you to charge it to the poor soil in which those British ideas were planted, a century or two ago.

We would like to get as near as possible to a real interchange of ideas—a meeting of two groups of mind. I feel, perhaps, that I should introduce to our British friends this Society for the Promotion of Engineering Education. The society was born at an international gathering at the World's Congress at the Chicago Exposition in 1893, and has grown steadily to about ten times its original number, starting with about 150 members and now has 1,500, and contains representatives of over 200 educational institutions. A large propor-

tion of our membership comes, of course, from the United States, with widely scattered homes from the Atlantic to the Pacific, and from Canada to the Gulf.

It is interesting on the present occasion to note that we have in the Society thirty-two members from Canada, seven members from Australia, four members from India, and two members from England itself. This society was the first in the world to organize for the promotion of engineering education, and so far as I know it is at present the only society of that kind.

Now, in the United States we have a number of strong societies dealing with education, especially a number of strong societies dealing with higher education; but this society, so far as I know, is the only one in the United States dealing with a special form of education. If I stop with that form of statement it might appear that this society looks at education from a narrow and restricted point of view. The fact is, however, that the Society for the Promotion of Engineering Education has habitually considered its problems on a very broad basis. The prevailing idea of this society is that our business is to train men for service as engineers. To understand the views of this society I think it is necesary for you to keep in mind we consider engineering is a profession rather than a trade, and therefore that we believe the proper form of engineering education is one which trains for a profession which is at least as high in its requirements as the law, medicine or the ministry. We consider that in a trade one offers skill to the world, and that in a profession a man offers to the world his expert knowledge.

We do not consider that it is primarily our business in engineering education to give a man skill in the shop, in the laboratory or in the construction-camp. On the other hand, we believe the primary purpose of engineering education is to develop a sound basis for such expert knowledge in the future that the engineer may well direct others in utilizing the forces of nature for the benefit of man. The development of skill

belongs in the trade schools, which we sadly lack in this country—lack in numbers, at least; and in this society as a consequence there are too few representatives of the trade schools. The development of the germs of expert knowledge applies to colleges of engineering of the type which this society would like to see developed.

The distinction between skill and expert knowledge, it may be clearly seen, leads to a differentiation in various places in the program of education of the two kinds.

I would like to turn aside to another line of thought for a moment. A man while speaking usually or often has trouble to control himself in such a way as to say the things which on riper reflection he will realize were the things best to be said at that time. It is still more true in a meeting like this that one has a similar difficulty.

Just at the present moment this society is likely to have difficulty in controlling itself as to what shall be the proceedings of this series of meetings. There are abundant opportunities to spend time on the little details and miss the main points; especially just at present there is a strong temptation before us to talk of the recent and temporary troubles due to the war experiences which we have just been going through. It seems to me it would be a misfortune for this meeting to spend much time in dealing with those temporary matters. I hope, therefore, that I shall have your coöperation from the floor if you find I exhibit a tendency to try to steer toward the main points and to avoid spending time on our temporary troubles.

It seems to me the three topics chosen for this meeting are especially fit for the occasion, and I say that because I did not have anything to do with selecting those topics. It is obviously important that we should discuss now the effect of the war upon education. Under the stress and stimulus of war we have just tried educational experiments, and we have had to make various changes. Now while the facts are still fresh in our memories is the proper time to discuss the larger features

of those matters, to bring out the points which may help us in future work. Some of the things that have been done should be retained; possibly out of our experience will grow some new things, and attempts we have not tried to change recent experience may suggest.

It is then clearly right that we should concentrate a part, at least, of this meeting in considering what new departure should be made from our new experience.

When I looked at the topic, "The Organization of Engineering Education in the United States," it has occurred to me that the fact is we have something more than six score colleges of engineering in the United States, each legally independent of the other, and that the principal bond which ties them together is this Society for the Promotion of Engineering Education, which meets once each year when we discuss our prominent problems.

The topic, "The Liberal Element in Engineering Education" is at home in this society. One of the things that attracted me to this society was the discussion indicative of an aspiration for the more liberal education for engineers than that in vogue in our American universities and in the parts of universities devoted primarily to a liberal culture. Those aspirations on the part of the society are to me the thing, or one of the things, that give to the association its flavor.

Recalling President MacLaurin's remark about the shortness of the time, I am also reminded that when I consulted the little demon of the inner recesses of my mind, to whom I would go for instruction, and especially with regard to this meeting—I had some trouble in getting any response from him; but finally, after I insisted, with much squirming he said, "Well, at any rate you can so conduct yourself that afterward they will remember of your talk that brevity was the soul of it."

RESPONSE TO ADDRESSES OF WELCOME.

BY ARTHUR EVERETT SHIPLEY,

Vice-Chancellor of the University of Cambridge, Master of Christ's College and Reader in Zoölogy.

Ladies and Gentlemen: I begin with a word of thanks to you for receiving us, and we greatly appreciate the honor of being here. And then I must follow that with a word of apology, for owing to some mishap we shall not be able to be with you to-morrow. We are traveling in your country very much as representatives of the dramatic agencies travel; our time is not our own, we have not made our own arrangements; we go hither and thither as told, and all I can say of the mistake that has arisen is what the schoolboy said when the school inspector asked him who wrote Hamlet—"Please, sir, I didn't."

Then I must apologize for the absence of Sir Henry Jones. I am sure you will understand when I state to you that of his three sons one has been killed, one is a prisoner in the hands of the Turks, and the third having a month's leave from India, it was the only chance for his father to see him. Otherwise you would have had the pleasure of listening to a man of real eloquence.

With regard to the special meeting before us I can contribute but little; all I know is that in our university we attach great importance to a thorough grounding in science, and any man to get into our school of engineering has to pass a very stiff examination in mathematics.

I might perhaps tell you a little about our engineering school; it can be put into one word. It was a very flourishing school, but at the present moment it is ruined; the buildings left were turned into shell factories, with no students and no teachers.

It is appalling the number of fatalities in the air-craft service, particularly among the professors, and it is typical of families in England that a mother is left with only one surviving child out of a family of six.

That is the sort of thing that is going on in my country; I do not think that over here the conditions are fully realized as to what has happened in that little island we represent. For instance, those of you who have been in France lately will bear me out in saying that food conditions are much better than in England. I do not think it is realized that the English forces have been fighting on thirty fronts, and that the casualties have amounted to half a million more than those of our allies. Those things do not seem to penetrate into the American papers.

Well, we are comparatively used to it. I consulted statistics connected with the university and found that in the big War of the Roses we were not affected so much as in the revolutionary wars under Cromwell. Later on in the time of Napoleon their numbers went down again; not so low as now but very low indeed. At present we are depleted of students to such an extent that we have run down from 4,000 undergraduates to 400. My own class of fifty in June, 1914, dropped immediately to a lady, a Chinaman and a black man, and at the end of three terms they went away and I lectured the following three terms to a black man from Africa—and when the lanterns went down I didn't even lecture to him but to a couple of eyes and a row of teeth. I lectured because in an old university, with all its faults, we have a certain respect for tradition, and I didn't want it thought that my class had come to an end. Now we are picking up a little; the government has sent us a large number of men, and I appeal to you to let your young men coming from the front—those boys who missed their university education—give them a chance while they are across the Atlantic and send them to an university in France, Italy or Great Britain. We are prepared to have special short courses to meet their needs, and pre-

pared to give diplomas at the end of one term or a more full certificate at the end of three, which I believe the college authorities in this country would count towards their college course. I think that is one way in which we can clearly help, because if those boys go to one of those universities they can be called back from England, and they cannot get short leave across the Atlantic—and I believe that would be as much as could be done to stimulate a constant, never-to-end amity and friendship between these two nations.

Getting to understand one another would be far more effective than any "league of nations." We have seen the "peace palace"; we have had Mr. Carnegie's magnificent building, vouched for by the Czar, and we have had Mr. Ford come over on his mission; but, believe me, most of those missions have been largely engineered by cranks, and I do not use the word *crank* in its engineering sense.

Let us get together and talk things over and be friends, and above all begin with the young men. I have been watching men the last thirty-five years, young men and boys, and it is the young men who develop into men. Again I thank you very much.

ADDRESS.

BY REV. EDWARD MEWBURN WALKER,

Fellow, Senior Tutor, and Librarian of Queen's College, Member of the Hebdomadal Council, Oxford University.

Mr. Chairman, Ladies and Gentlemen: It has been represented to me that it would be quite in accordance with the spirit of this gathering here this afternoon if I were to put before you some of the views that I ventured to put before another gathering yesterday morning. I was asked if I would do that with the assurance that the audience would be different, and I was told there would be very few people present this afternoon who heard me yesterday morning; but to those here who did hear me yesterday forenoon I tender my humblest apologies.

Now, the question of engineering education is quite clearly a question which is of much more importance here in America than it is at home; the very fact of your society being constituted to deal with that question is proof of that. We have no such society at home, I think I am safe in saying; and the reason why the question is of much greater importance in America than in England is due to the very simple fact that the profession is infinitely of more importance in America than it is at home, for there the difficulty is to find jobs for the men, and over here the difficulty is to find men for the jobs. It is the difference between an old country whose resources have long since been developed, and the new country where incredible resources are merely awaiting development.

Now, we have traveled a good deal in this country; by tomorrow evening I think we shall have covered in this country over 8,000 miles by train, river-boat and car; and in going about we have kept our eyes open. At the end of last week we were passing on a train through Texas, and everywhere

about us there was oil; everybody was talking of oil. Then we came to a bit of the line where the predominant hue was a bright yellow, and we passed cars laden with sulphur, and we heard the marvellous and almost incredible story of that deposit of pure sulphur. We felt as we looked on the one hand and the other what was contemplated in Dr. Johnson's familiar words, "the potentiality of riches beyond the dreams of avarice." We felt all that was wanted there was population; all that was wanted there was engineers, and the wealth is yours.

But though the question of the education of engineers is a far more important question—a question which forces itself upon the public mind here in a way it does not upon us, and is a profession so much more vital to the country, the point I wish to make first is this: The point involved in this question of the education of engineers is a problem not confined to engineers of this country, nor to engineers in general; it is not confined to any one country, it is not confined to any one calling or profession, for what we have to deal with is the difference—as profound a difference as well could be conceived, between two ideals, two views of education—between the short view and the long view. Between the view of those who are able to look ahead and content to wait, and the view of those who refuse to look much beyond the end of their nose.

Now, this war in our own country—and I have no doubt it is the same here in America—has brought to the front a very old friend of ours, the practical parent. The practice in England is for the man to sit down and write to the *Times*. In America you don't do that, for there is too much matter in the papers to find space for correspondence.

The practical parent has succeeded in finding room, notwithstanding the shortness of paper, even in the *Times*, and the sort of question he has been asking is how it is possible in view of the income tax of ten shillings on the pound—how is it possible to waste the money to send sons to college to learn useless accomplishments? They must learn something of

practical good to them in the particular profession they are going to embrace.

Now, those people know what they mean, and it is not at all difficult to interpret what they mean; what they mean is this: Their son is going to be a merchant; it is necessary to learn a foreign language. What is the foreign language to help him most in a particular branch of trade? Well, say, Spanish, which is a comparatively easy language to acquire. Very well, how far is he going in the study of Spanish? Shall he be allowed to read Don Quixote in the original or shall he learn to conduct a conversation with Spanish friends offhand?

Of course that comes very plainly in the case of engineering, and the case for the practical man there is the strongest possible case, because the technical knowledge required of the engineer will occupy so much of his time; he wants so much more of the difficult technicalities of a language than most people do. And your practical man will be brought to see that there are certain things that the engineer must learn.

He must learn mathematics up to a certain point; he must learn to express himself in English up to a certain point; it is possibly of advantage to learn foreign languages up to a certain point—and it is always up to a certain point, and it is resolutely determined that your engineer shall not learn anything beyond that certain point. That is the one view we are all familiar with.

But there is another view of education which is this, that the whole end of education is to give men good minds instead of poor minds; to free them from superstitions of every sort and kind. And what superstition is more degrading than belief in the verbal instruction of the textbook to enable them to reason, to criticise, to infer. That is the other view of education, and it is quite clear that in stating that view I am stating no case for the old humanities or the newer humanities.

It is not a defense of education in literature as opposed to education in science; it is a defense of every good form of education. It is a defense of the full and free study of any sub-

ject that is worth studying. It is a defense of physics as much as of Greek; for what we claim there is this, that the student shall be allowed to study that subject which appeals to him; not up to certain points but up to any points he pleases, and he shall study it in such a way as to clear his mind so to give him power of thought, of criticism, of inference; in a word, to give him a better mind, a better instrument than he started with.

Now, what I venture to claim is this, and I feel quite sure from what fell from you that that is the view all in this room share; that that is really the long view opposed to the short view—the view which in the long run is going to make better engineers; it is the view which in the long run is going to be the most practical—it is the view which will be the best.

But there is a case for the inclusion of the humanities, even in the education of the engineer; for while I do more than admit—I assert—that in any form of education worthy of the name the study of any subject that is worthy of study does enable, or may enable a man to think, does give him a better mind than before.

There are gifts which are peculiar to the humanities; I do not mean the older humanities, I mean humanities in the widest sense—the study of literature and all that literature means; the study, for instance, of philosophy.

Now, the great gifts the study of the humanities can impart, besides this general gift of thinking, are the gifts of imagination and sympathy. But, as I was saying yesterday morning, there is imagination—and imagination. There is the form of imagination which is of peculiar importance to the engineer, and that is the scientific imagination; but imagination in the general sense I suppose everyone would admit is more likely to be stimulated by the study of literature than by the study of natural sciences; and though it may be objected to that there is such a thing as the scientific imagination, no one has ever claimed that there is such a thing as the scientific sympathy.

Everybody in this room can see what is the value of the scientific imagination to the engineer, and precisely so because the scientific imagination is of such supreme importance to him in his work—in his calling. The engineer who is well educated—well educated in the sense of a wide education—is likely to prove in the long run the better engineer; but why, it may be asked, is imagination in the other more general and wider sense to be considered, and why is sympathy of importance to the engineer?

I think there are two reasons, maybe three, but two reasons are suggested, one of which is a reason peculiar to the man as an engineer; the other is one that applies to him not as an engineer but as a man.

Now, I suppose we are all agreed about one point, that in the next few years there is going to be a great deal of difficulty in adjusting claims of labor and capital. I can hardly think of any class of men more likely to be brought directly into touch with problems of that sort than the engineer.

Do you remember, and some of you will know, that Mr. Rhodes when he founded the Rhodes Scholarships provided that a certain number of marks in choosing the candidate were to be assigned to what he called "the quality of leadership." And whatever you may think about Mr. Rhodes, or about his will or foundation, no one will question that Mr. Rhodes knew the world and human nature, and no one will dispute that he was a successful man of business. His experience with business in the world taught him the value of that quality in business of leadership.

Now, for that quality of leadership is needed quite clearly these two gifts of imagination and sympathy. What is the fundamental difficulty in settling questions of dispute between masters and men, between employers and employed, between the claims of capital and labor? No one in this room could tell. It is the old, old difficulty, as old as the hills—one class putting itself in the place of the other; capital seeing the problem as labor sees it, and labor seeing the problem as cap-

ital sees it. The employer will never put himself in the place of the employe; he will never see the problem from the employe's point of view without these gifts of sympathy and imagination. And surely half of the present trouble in the world—three fourths I can say with confidence—of the trouble connected with labor questions in my country (it may be different here) but in my country I can say with confidence that three fourths of the difficulty arises from the fact that employers as a rule have had a bad education instead of a wide and liberal one; because their education has not been such as to develop within them these divine gifts of imagination and sympathy.

Gentlemen and ladies, that is the reason that applies to the engineer, but after all, no matter what scheme of education you may contrive for your engineer, no matter how narrow and practical it may be, no matter how short your view, there is one thing you cannot do; you cannot train your student into a mere engineer; you cannot prevent him being something over and above an engineer; you cannot prevent him looking forward to marrying and being the father of a family; you cannot prevent him from having relations with his neighbors as a citizen and friend; you cannot prevent him from some day having to face some great sorrow in his life. And if he is going to become a man; if he is going to discharge the duties of a father, of a friend, neighbor or citizen, how else is he going to do all that without these gifts of sympathy and imagination. And if he is called upon to bear some great trial is he likely to find that trial easy or hard to bear if his education in the humanities has brought him in contact with the master minds of all the ages?

Ladies and gentlemen, to those of you who heard me yesterday, I am going to offer one more apology. One of the most unpardonable of social offenses is to tell what you think to be a good story a second time to the same audience. Whether this story is good or bad you shall judge; I can only confess that I told it yesterday. Some years ago I chanced to be in

Paris, stopping at a hotel I used in those days always to stop at; an old-fashioned hotel with a real table de hôte, one long table where you never knew whom you would find next to you, but whoever it was you talked to him or her. In this case it happened to be to him, and he had come from a well-known university in the middle west, being abroad as secretary to an international conference on employment. And I was asking about his university, and he was telling me that in the faculty in which he studied, the faculty of history, there were thirty-eight professors. I dare say he used the term professor in a somewhat loose sense, but there were thirty-eight.

I told him I was a student of history, and at my own university a good many people studied history; and he looked appreciative, and that led me into the fatal trap. I was foolish enough to blunder next into the question whether at his university there were any professors or students in ancient history. Then he smiled with a fine compassion and said, "At our university history is understood to begin with the rise of the industrial movement in America."

Now, ladies and gentlemen, I will put to you this question, Do you think your engineer in the future is going to understand the rise and progress of the industrial movement in America if he knows no history before that movement began? And do you think he is more or less likely to be able to solve, to deal with, to handle the industrial problems that confront him, if his knowledge of history, if his sympathy and imagination reach or do not reach back beyond the opening years of the nineteenth century?

ADDRESS.

BY SIR HENRY MIERS,

Vice-Chancellor of the University of Manchester and Professor of Crystallography.

Mr. President, Ladies and Gentlemen: You were quite right when you said I was surprised to see this program last night, and to discover I was apparently expected to deliver an address on a subject upon which I had not thought at all, because the program, I am sorry to say, did not get into our hands until last night. I have come, quite unable to say anything about this particular subject; and I have prepared no notes, for I could not think of anything appropriate to be said on the present occasion. I think if I had had time to consider it, I should not have much to say about the present organization of education of Great Britain, because I take it that the whole educational prospect in Great Britain is faced with great changes now, and one does not know exactly what has been discussed at home since we left England nearly three months ago. But I am going to gather together a few impressions produced on my mind in our journey through the United States, qualifying only with this remark, that in visiting universities—and we visited a large number—we have been singularly unfortunate in the things which concern this meeting most, and us intimately, for two reasons—wherever we went we were unable to see the laboratories and in but few instances saw the students; we have not been able to criticize or witness teaching of a subject or hear the students' views on education, and it is very difficult to-day to compare with Great Britain.

It was still more unfortunate that wherever we went many students were absent on S. A. T. C. work, and there was the still more disastrous circumstance of the epidemic of influ-

enza, which prevented our seeing, in many cases, what might have been viewed if that had not been the case.

As far as my experience in England—for I have only been at Manchester three years and only seen the working of the university under war conditions; and under those conditions the work has been as different there as it has been here. The majority of the students have been carried away from the engineering laboratories into actual war service, and of those who remain a considerable number are assisting in research connected with the war; and all the resources of the colleges have been devoted to practical problems connected with the war; so I am only able to speak of ordinary conditions there.

In London, several years before I went to northern England, the question of engineering education was a difficult one because of abnormal conditions. During the whole of my time there I was engaged on a report on the University of London and revising many of the details as to how education could be organized in that extraordinarily complicated machine. There the question was how to insure that the various colleges in which engineering was taught might be induced to coöperate with each other and form one homogeneous system.

I will mention one or two things that stand out in my mind. One was, in London there was a very strong disposition in several of the colleges there to encourage more and more the invitation of specialists from the industries to come, lecture, and take part in the teaching of the various colleges—not men necessarily engaged in teaching before, but men from life-long engineering practice, and very great benefit was found to grow from that somewhat new development.

Then, in Manchester, we are faced with a situation something like that which prevails here. We have a great technical college there alongside, but not actually a part of the university. As a matter of fact, in Manchester, the college of technical training is practically new to many here, being the property of and administered by the city, but it works as a very close corporation with the university, and I think

there, as with the Imperial College in London, where similar conditions prevail to the same extent, the technical colleges gain from close contact with the universities, for with us the university, as contrasted with the technical college, stands for liberal education, and the mere fact that the technical college is immediately connected with the university guarantees that the training shall not be of a purely vocational type, but will stand for the more liberal provisions necessarily made by any university.

Extremely important in the British system is this, that the function of conferring degrees is vested in the university alone. The engineering college, although it may have been founded quite independently of the university, if it wishes to obtain for its students degrees, gains everything by coming in close connection with the university through which degrees can be conferred, and there is the necessity of widening its curriculum and of strengthening the liberal side of the education given.

I have always thought myself, and this an allusion to what Dr. Walker has just said, to some extent, there was one aspect of education left out of account by any scientific and technical training, and that is the more detailed study of the history of scientific thought. You may call it philosophy or what you will; but if it forms an integral part of technical education, you will find something of human interest and even of human sympathy which goes to build up the history of the development of scientific thought.

Now, if I had known I was coming here to address a meeting of teachers of an engineering college, before starting I should have taken some pains to ascertain in England what was contemplated and being done. As a matter of fact, in the north of England the engineers were proposing to report on the whole question of engineering necessities as I left, and issued a draft of important subjects. I have not brought that with me and could not get important information on what they were reporting. But I think it will be found that there

is in the north of England at the present time a tendency developing to expect that the student—the university student in particular—shall get his practical experience in work to some extent before he comes to the university. Of course, there is the lifelong discussion about sandwiching practical experience with university teaching going on there as elsewhere; but I think the tendency is now rather to hope that the engineering student will be expected to get some familiarity with the conditions of practical work before he enters the university course and not develop any elaborate system of sandwiching technical experience with college training, although the conditions are good to get practical experience.

I think it will have a tendency to develop some differentiation of courses leading to different grades of educational experience so those qualifying to become managers, those qualifying to become directors, and those qualifying to obtain advanced positions with the works will be encouraged to pursue the differentiated course. I do not speak with authority on this matter, however.

But there is one fact worth noting, that the British universities, partly led by a desire to encourage the interchange of students between Great Britain and America—and that, as you know, is one of the objects of our Mission—but also inspired by the desire to improve their own schools of advanced study and research, the border universities have begun to institute something closely similar to your doctorate of philosophy. We had formerly no doctorates except such as was given for a very high standard of work, and not necessarily involving any systematic course with the university that gave the degree. In Oxford, Manchester and other universities, this new doctorate of philosophy has been established, giving to all faculties which will be given under a systematic course of advanced study and research lasting some years. We think that will be a great help to us in strengthening our own university schools of advanced study, and also be a convenience to those American students that come to Great

Britain for university work and the work leading to a doctorate.

One feature of the work will be that students can pass one year in the period of the doctorate at another university recognized by the university at which he has studied, and further the only condition in those directorate courses will be that the student is a graduate of a part of the university and it shall appear that he has qualified to pursue the course which he intends to enter.

In our journey through the states I was only one of the commission to do so who was able to visit the University of Cincinnati, which interested me because like Manchester it is a civic university, and also because I was able to hear something there about a very elaborate system of coöperative work which prevails in the engineering department. I won't say anything in criticism of that as you know what it consists of, but it did seem to me surprising that so short a period as a fortnight should be chosen as the period during which the student alternates from practical work to practical work in the engineering shops of the university, and yet it seemed an extraordinarily satisfactory system and worked extremely well. But I noticed one thing in traveling among the universities, and conspicuously there, that the laboratories are so frequently encouraged to receive gifts of machinery, given with the best of intentions, but which, being gifts, have been allowed to remain so long in the laboratories as to become obsolete, but in Cincinnati they escaped that difficulty. And in some other laboratories the heavy machinery used seemed to be deposited on loan from machinery works, and therefore again seemed condemned to remain in perpetuity in the laboratory after it became obsolete. I think our own engineering laboratories have a great deal to learn from this country; I think they will see in many cases a tendency for machinery to remain too long in the laboratory where first used. I think we fully realize in Great Britain that it is the duty of our university in particular, in conducting engineering education, to

have special regard for the claims of those intending to become captains of industry, and a very great effort made to discriminate between training in the technical school with the more liberal and wider training given in the university, only we have far too few institutions where that training is being provided. I think I am right in saying there are seven times as many students of technology in your schools as in ours, and that it is a very large disproportion; it means we are not training a sufficient number of those who are destined to become leaders in the engineering world, and are devoting perhaps too much attention to merely the rank and file of the profession on whom some of the university training would be to some extent wasted.

Now, a very interesting feature growing up in the north of England at the present time is the effort to encourage the universities to get into closer and more intimate touch with the industries, and a significant feature of that is that a considerable number of firms are beginning to find it worth their while to institute scholarships at universities. It is true of chemical tests that young men may be trained in methods of higher research work. That will be encouraged by us. I fancy it is exerted here more than with us, and it has been sugested in England that it would be very welcome at our universities. But I think I particularly wanted to call attention—and the reason was, at least one of the reasons, why we came here to-day—was to call attention to the fact that in my mind under present circumstances of the world's history we have got to remind ourselves more than ever of the more national and international responsibilities which attach to the profession of engineering and mining engineering—the professional engineer and the mining engineer. He travels over the whole world, obtains positions of great responsibility which often lead him away from the profession to other responsibilities, more than falls to the lot of other professional students. I think Dr. Walker alluded to that, that he is a man who will have to gain a very varied knowledge and ex-

perience of the world in all its aspects, and have to know how to deal with men. He has the advantage of providing for the alternation of his experience in the works with experience in the laboratory, and it does bring the student, at an early stage of his career, into close contact with the workers themselves.

We are face to face in the immediate future with very important and very difficult labor problems which make one think it will be disastrous if we send out in the engineering and mining profession men who have had too much academic experience and too little experience in practical work. It is now more than ever necessary to them to be in close, intimate, sympathetic touch with the men working under them, and it is desirable to have such subjects as industrial history and social economics made a part of all engineering courses. I do not know how far that is the case in the states at present, but I know that with us that ought to be one of the humanistics necessarily introduced into engineering education to a far greater extent than as at the present time.

There is the recent development in England in favor of introducing in some engineering courses more definite and detailed instruction in business administration. I have noticed where that has been mentioned in Great Britain it has been regarded with some suspicion by the workers themselves, and if they are to have increased influence in educational problems —at any rate, in Great Britain— they will look with suspicion on anything that bears the name of industrial or business administration which seems to them to mean the vocational training of the worker in order to make him a better mechanic.

There is a remarkable movement taking place in Great Britain at present in which the more intelligent, the more intellectual of the workers are claiming more and more for themselves and their associates non-vocational training of the same sort which has been the privilege of the employees in industry to receive. Forty years ago, there was a new impulse to vocational training in England, very conspicuous

at the time, but now there is a movement emanating from the workers themselves asking the universities to give them more non-vocational training of a sort which will help them to become better, happier, wiser citizens as well as more effective workers in their respective industries. That request coming at the present time is very largely responded to by the universities and I hope will lead to closer and more sympathetic relationship between the universities and the workers, because there has been a somewhat growing suspicion on the part of the workers, not only towards the employers and capital as a whole, but towards the university as standing somewhat away from them and providing for a different class than those now anxious to enter into the university.

In Great Britain, new impetus is given to this by the new educational act, which provides there shall be continuous education from five to eighteen, and that means that in those workers who left the primary school at fourteen to go straight into industry, they would have to attend continuation schools for eight hours a week during forty weeks in the year, being paid their wage, that being regarded as a part of their business career. In the continuation schools it would be too much expense of a non-vocational character, and if that is properly administered, and if the university took a proper share in it, they will be more than ever able through schools of engineering to get into sympathetic touch with the situation. I apologize for the somewhat rambling character of my talk. I thought of speaking about something else, and, between the two, have given you a very unsatisfactory and fragmentary discourse.

ADDRESS.

BY DR. JOHN JOLY,

Professor of Moral Philosophy, University of Glasgow.

Ladies and Gentlemen: It might appear I knew all about this subject because I am a civil engineer by profession, but when I tell you that the total amount of money earned by me as an engineer has been sixteen and eight pence, you will decide that I have not had much practical experience; in fact, I appear as a teacher of applied civil engineering, and also of most of the subjects that enter into the curriculum of engineering study.

Now, I am not able to speak on the subject of mechanical engineering. The branch of the subject upon which I hope to address a few remarks to you is what we call civil engineering in Great Britain; it is concerned with the construction of railways, of harbors, of roads—civic engineering, generally, and so on and so on. It may be interesting to you to know what the curriculum is in such British schools of civil engineering as are distinct from those where mechanical engineering is taught. For instance, in my own university, the University of Dublin, the student learns practically no mechanical engineering. His whole time for three years is spent in the study of civil engineering, and he has a busy time of it, and except we added another two years or another one it would be to add to the present burden on any of the subjects desirable for an engineer to study. The time of the student is absolutely occupied; he is lectured to about five hours a day on the average, and, in addition, has his own work to make up in the evening; so he hardly gets time enough to keep himself in health by the necessary amount of athletics which we encourage.

In the first year of his work he enters upon the subject of mathematics as a primary and most important subject, and he is carried as far as the differential and integral calculus, so far as that branch of mathematics is required for the solution of problems in calculating the strength of girders and other mechanisms. He is also taught dynamics, kinetics, and so forth, and all the branches of the subject; he is also taught chemistry and physics—all this in his first year. He is taught mineralogy, he is taught leveling, and he is taught building construction; meaning by that simply the use of bricks, mortar and ordinary masonry.

In the second year his mathematical education is carried a little further, or, rather, I should say he is practiced—he applies this mathematics more than he did the first year; the first year is more theory, and the second year more the application of it. He carries his engineering studies further. He deals with hydraulics, with the subject of road construction, civil engineering and railway engineering; he also studies physical geology.

In the third year—his third and last year—he goes much further into the problems of constructional engineering, such as archway construction, retaining walls, and any other engineering constructional work which enters into the work of the civil engineer. He studies historical geology, petrology, the study of rocks and mining; he also studies electrical engineering especially, and the steam-engine.

You will imagine now—those of you who know what I am talking about—that the student has a good deal to do in those three years; he is about as hard worked as he could be.

Now, about the humanities that Dr. Walker was talking about. Well, we have the provision in Trinity College that the student cannot obtain his degree in civil engineering except he is, first of all, a B.A.—a bachelor of arts. He can if he is able to run the two concurrently. The bachelor of arts is a four years' course, and it very often happens that the student having matriculated in the arts takes this first year

of the arts by himself, and on the second year he joins the school of engineering, so that his course in engineering and course in arts ends simultaneously. But, you see, he is compelled to read somewhat into classical knowledge, which is restricted to Latin; that is the only branch compulsory upon him. He may take Greek if he likes, in addition to the Latin, and also the modern languages, English literature, logic, and so on—a few other subjects; but he cannot become a civil engineer, he cannot boast of being a B.A.A. of the University of Dublin except he has first taken his B.A. He can take a diploma or license—we will give him that—a licentiate of the Trinity College of Dublin is a man who has certainly less general culture than the man who can boast of the degree of civil engineer.

Now, what I have said about the University of Dublin applies to other universities in Ireland, to the best of my belief, but changes are so frequent I cannot talk with certainty, but it applies to the National University and to the University of Belfast.

I think it is likely that an American student coming over to us, as I hope they will, would find some changes in the way engineering is taught in our Irish universities; and I may observe here that I believe the University of Edinburgh is much the same in its curriculum—I believe the students would find some changes in taking up the engineering course of these universities. They of course differ very much from the schools of engineering which generally exist in your American universities, so far as I can gather. The student, with us, is taught practically no mechanical engineering. The design of the girder—I won't say "design," but the construction of the girder—is left to the mechanical engineer; the civil engineer can design it if he pleases and submit his designs to the mechanical engineer to have them carried out or modified. His knowledge is not supposed to extend to the technique of girder construction. He understands how to test materials for strength; he gets a course in the strength of materials, and

is shown how to use the testing engine and make the various tests required. He is taught how to use the lathe, but all the thousand and one things that the mechanical engineer has in addition to learn he does not learn. He is not taught them nor do I think it desirable.

Now there are one or two points I would like to dwell upon for you who are interested in the subject I am talking about, and they are points which after very long experience in teaching, I think, are too much neglected. In the first place, mathematics is, in my opinion, not carried far enough in the engineering schools, so far as I know of it. The difference between the student who can rely upon his mathematics and who knows how to state his problem in proper form so as to apply mathematics to it, and the student helplessly going about to get somebody else's brain to help him out of his difficulties, is enormous. To my mind, that constitutes the difference between the good engineer and, speaking generally, the second rate engineer; I do not say it is always the case, but in general that is the case.

Some men have not got mathematical ability—I quite admit that. There seems to be in some minds something antagonistic to mathematics, but most men can by careful teaching be brought to the ability of applying mathematics to engineering studies, because the mathematics is not really very advanced, and it is only a question of having patience and taking pains in making the student a master of the amount he should know.

There is another subject I think is too much neglected and that is the subject of handwriting—calligraphy. Over and over again the student who is supposed to have finished his engineering course really cannot write as he should; he spoils every engineering drawing with which he is concerned or for which he is allowed to do the writing. Now, I do not say the writing should be quite as ornate as those letters which reached me from your association, and which contained the most beautiful calligraphy in the best India ink, it cannot be so elab-

orate as that, but it should be clean and neat and not sprawling all over the paper. Students should be taught, above all, to write well.

Now the subject I have been teaching the last fifteen or twenty years is geology, and I would like to say a word as to the absolute necessity of the civil engineer's learning that subject. I quite admit that mechanical engineers may not require it, probably they won't; the man who spends his life in the workshop may not need to know anything about rocks, minerals, or stratigraphic geology, but the engineer who wanders over the world has great chances of finding new deposits and to rely on his own knowledge for the value of building materials, and to turn out that man without a good knowledge of minerals and rocks is simply an act of wickedness; you deprive him of the chances which fall to him in the pursuit of his profession.

I remember some extraordinary examples of that in the course of my life. I have known a student to send from India to London a large sack filled with ordinary yellow mica, known as biotite, which looks something like gold, looks like little spangles; and he filled a bag with these spangles and posted it in a sack to London to have it examined, which was a silly thing to do. Another case I heard on good authority of an engineer who constructed a railway line some place in South America, allowing a valuable amount of cinnabar to spoil. In fact, he constructed the railway of cinnabar, which is the chief ore of mercury and exceedingly valuable. The cinnabar remained there with the trains running over it until found by accident by a mining expert, who, looking out the carriage window, noted the brilliant color with something unusual about it, and he went back to examine it and found out what it was. That is an example of what bad engineering can bring about. Another case of a different character arose in the neighborhood of Dublin some time ago. There was an extensive and valuable erratic of granite, the most beautiful boulder in Ireland. This block of granite, about half the size

of this room, had been carried a distance of six miles from the mountain and was resting on the Cambrian Rocks of Wicklow. They were constructing a dam to increase the water supply of Dublin, and the engineer in charge broke up this erratic for the sake of paltry tons of granite that was in it, and carted the whole think away, destroying a natural curiosity of the greatest value and interest; there is not a trace of it now, and I think the engineer ought to have had a sufficient knowledge of engineering to know what he was dealing with and not be guilty of an act of destruction of that kind.

Well, now, gentlemen, I do not know that I have anything to add to what I have said. I am trying to keep as practical as possible, because you have had remarks of a more or less theoretical character, but I am in substantial agreement with practically everything that Mr. Walker and Mr. Miers have said.

KEEPING THE TEACHING FORCE ALIVE.

BY CHARLES ALLEN WRIGHT,

Professor of Electrical Engineering, The Ohio State University.

During the discussion of all phases of engineering education which is to be expected now that Dr. C. R. Mann's "A Study of Engineering Education" has been published, is the proper time to make a suggestion in regard to one of the most important problems which is presented to engineering schools, that of keeping the teaching force in touch with commercial engineering development.

As was mentioned in this report, the tendency in most of our engineering schools has been to encourage research, principally in the field of pure science, and the importance of educational research which has been neglected was emphasized. It is probably even more important that the instructional staffs be developed along commercial engineering lines. By far the greater number of engineering students should follow the course of instruction in which they are properly most interested, that of becoming acquainted first with commercial engineering problems and methods, and then if they have a natural adaptability for scientific research, undertaking work of this nature. In order to instruct students in this way it is essential that the instructors have a reasonable amount of first hand knowledge of commercial engineering practice, and it is much less important that they have any of the knowledge or ability developed by research.

It is not the purpose of this article to consider the salaries of the instructors in our engineering schools. Little need be said about them. All who discuss the matter agree that salaries have not kept pace with the cost of living or with the salaries paid men of like ability in commercial work, and the consequence is that many of the best instructors are attracted

to commercial pursuits,—or we might better say forced to them, and many more of those who, actuated by more or less altruistic ideals, do not give up educational work, are prevented by never ceasing financial worry from reaching their greatest development. For the older teachers who have been able to establish national or local reputations as experts in their professions and are thereby able to obtain employment as consulting engineers, the problem of keeping alive to developments in their field and the points of view and methods of work of practicing engineers is not difficult. Not only are they able to keep their minds alert and well informed, but their consulting fees are generally sufficient to protect them from financial worry which would make the struggle to exist rather than the struggle to create their most urgent problem. This is not the case with younger teachers and the effect of these conditions upon them is reflected in the quality of their teaching. In most engineering schools the bulk of students are taught to do commercial engineering work by men who have never done any of it.

It would not be just to underrate the chances offered instructors to develop, not by the colleges, but by manufacturing and public utility companies. Many of these, such as the General Electric Co., the Western Electric Co. and the Westinghouse Electric & Manufacturing Co., offer instructors generous inducements to spend the summer months or other available time at work in their shops and offices. The greatest objection to such experience is that men do not retain their connection with these companies for a sufficient length of time to become familiar with the routine followed in the various departments so that they may be made responsible for important work. In order that they may be of value to the companies who employ them, to themselves and to their students, it is essential that they take the responsibility for work of at least moderate importance. Again, many instructors on salaries, in too many cases less than those necessary to live decently, cannot afford the expense necessary to avail themselves of the opportunities offered.

A plan which has been discussed with a number of teachers and executives of engineering organizations and which offers possibilities of improvement in these conditions is one by which engineering schools will exchange employees with manufacturing and public utility companies and other industrial organizations for periods of six months or a year, each employee remaining on the pay roll of the engineering school or industrial organization by which he has been employed, and that engineering school or industrial organization paying all of his expenses in making the change from one position to the other. Organizations such as the Western Electric Co., the General Electric Co. and the Bureau of Standards, would each have ten, twenty-five, fifty or more men as their needs demanded available to exchange for a like number of men from engineering schools. Such men of any one industrial organization would be distributed to different engineering schools each year, or retained in the shops or offices of the organization in order to obtain necessary experience.

If, for example, an electrical engineering department in some school of engineering employed two men who had specialized in electrical power machinery, one who had specialized in central station engineering, one who had specialized in telephone engineering and one who had specialized in electric railways, the telephone man during one period of six months or a year, would be exchanged for a telephone engineer from some industrial organization, as the Western Electric Co. The Western Electric man would have a fresh knowledge of telephone apparatus and practice, and after he has been exchanged one or more times, some teaching ability. Even the first time he was exchanged, his fresh and practical knowledge of telephone engineering would probably compensate for his lack of teaching experience, and he would at least be more satisfactory than the teaching assistants now employed in many engineering schools. The next year one of the power men would be exchanged for an employee of a company such as the General Electric Co., then the central station man would be exchanged for an employee of a large cen-

tral station, and so on. The engineering school men would remain long enough, six months or a year as suggested above, with the industrial organization to become familiar with the routine of the organization and to become responsible for more or less important work. These men would thus be of value to the industrial organizations and, because of the character of their work and the degree to which they would absorb the spirit of the industrial organization, their value as teachers would be greatly enhanced.

At the end of a college session during which a man from the Western Electric Co. would take the place of the telephone man, it is probable that most of the students graduating in electrical engineering would be persuaded to accept employment with the Western Electric Co., but the next year when a man from some other industrial organization would be detailed to the same electrical engineering department, that organization would have the preference, and the Western Electric man, if he were able to make a good impression on students, would be able to gain the preference in some other electrical engineering department for the Western Electric Co. Thus each industrial organization would each year have a number of spheres of influence, the location of which would change from year to year. An advantage of this condition would be that the present tendency in many electrical and other engineering departments of engineering schools to send all of the men year after year to the same industrial company would be decreased, and its alumni would be more widely distributed.

Each year there are many interruptions to regular work because of the visits of representatives of the various industrial companies in their scramble for men. These interruptions would be decreased because, although the preference of the students would determine where many of them would go, there would probably be a tendency for industrial organizations to concede the men in any engineering school department to the company represented in that department in that year.

It would be possible for engineering schools to obtain better instructors if such an exchange plan were established, because these men would not feel as they frequently do now, that they are cutting themselves off altogether from commercial work when they engage in educational work.

The objection might be raised by engineering schools or industrial organizations that such an exchange will mean that the employees of both the industrial organization and the engineering schools who are thus exchanged, will receive offers of increases in salary which will induce them to leave the organizations for which they are working. This is to be expected to some extent as the value of the men increases, but few organizations of the importance of those to which this discussion applies will object to taking such a chance in order to greatly increase the value of their employees and their work. The salaries may be expected also to soon reach a level beyond which there will be no marked increase which might be charged to the exchange employee system rather than to the normal increase in the value of the employees.

It would not greatly increase the salary and other expense of a large industrial company to have ten or more men who would spend every other year in colleges and it would be worth much to them in the improvement in the training of the men they obtain from the colleges. It would entail very little extra expense to the colleges.

The greatest objection to the plan probably lies in the difficulties presented to the men who will be exchanged, but both college men and employees of industrial companies will realize that these exchanges will be broadening and will make possible much development of ability, and it is not to be expected that they will hesitate when their value will be increased and their advancement promoted by such exchanges.

EDITORIAL.

Interchange of Students.—The one subject which was discussed more than any other by the British Educational Mission while it was in the United States was the interchange of students, or more specifically the sending of American students to British institutions during the reconstruction period. This matter was not discussed to any great extent with specific reference to engineering students but it is undoubtedly a live topic since we are appreciating more than ever the value of broad training in conection with engineering education. It would seem that some such plan as the following would tend to develop an excellent all-around man especially well acquainted with the general problems of engineering.

Let a young man complete his four years of engineering instruction in this country, spending a portion of that time in the industries thus becoming to a certain extent familiar with the applications of engineering principles to industries. Then devoting one or two years to work in one or more of the larger industrial concerns, then going to one of the English universities for further study in applied science, at the same time devoting a portion of his time to actual work in British industries.

This matter is becoming pressing because England has developed its industries to a much greater extent than America. In this country we still have enormous natural resources awaiting development and the work which is required of the engineer for this is quite different from that demanded of the engineer in an old-established country like England. On the other hand, this country, of course, tends more towards permanent industries, thus becoming more like England and it is this work which the next generation will handle. It is, therefore, important that engineering students should, if possible, have an opportunity of studying from one to three

years in British institutions and becoming familiar with English industrial plants. A man so trained would undoubtedly become a leader in the development of American industries.

COLLEGE NOTES.

Lafayette College.—A memorial scholarship, growing out of the World War, has been established in the Department of Mechanical Engineering at Lafayette College. The scholarship is to be known as the "William Ward Frick Memorial Scholarship," in memory of the late Captain William Ward Frick, of the class of 1914, who was killed in France. The donor is William E. Frick, of Sewickley, Pa., Captain Frick's father, and will yield an income of $250 a year.

CONFERENCE ON TECHNICAL NOMENCLATURE IN NEW YORK, DECEMBER 2.

An important meeting of the Committee on Technical Nomenclature of the Society for the Promotion of Engineering Education and representatives from other national engineering societies was held in New York, December 2. The following were present: Professor John T. Faig, Chairman of Committee on Nomenclature, Society for the Promotion of Engineering Education; Dr. Charles Warren Hunt, Member, Committee on Nomenclature, S. P. E. E. (secretary, American Society of Civil Engineers); Mr. L. G. French, Chairman of Committee on Nomenclature, American Society of Mechanical Engineers (editor, A. S. M. E.); Mr. George R. Metcalf, editor, American Institute of Electrical Engineers; Mr. J. M. Lloyd, Publication Department, Society of Automotive Engineers; Mr. D. E. Jones, managing editor, American Institute of Mining Engineers; Mr. Sanford A. Moss, Member Committee on Nomenclature, S. P. E. E. and A. S. M. E.

A preliminary discussion indicated that all present were agreed that the formation of a general committee for the

standardization of nomenclature, and particularly the standardization of symbols for mathematical and scientific work, was desired. A formal organization was made by the election of Professor J. T. Faig as chairman and Dr. Sanford A. Moss as temporary secretary.

A general discussion showed unanimous agreement on the proposition that the standardization of technical nomenclature is highly desirable and that this was an opportune time to take up the subject. There was a discussion of the status of those present and it was agreed that the Conference should consist of the original S. P. E. E. committee with the addition of delegates appointed by the other national societies. It was agreed that the Conference should be enlarged by the addition of delegates from all other national societies which might be interested. A tentative list of societies to be represented was made up as follows, subject to additions by the chairman:

Society for the Promotion of Engineering Education.
American Society of Mechanical Engineers.
American Institute of Electrical Engineers.
American Institute of Mining Engineers.
Society of Automotive Engineers.
American Society of Refrigerating Engineers.
Society of Heating and Ventilating Engineers.
American Physical Society.
Western Society of Engineers.
Bureau of Standards.
American Engineering Standards Committee.
American Society for Testing Materials.
American Chemical Society.
American Society of Chemical Engineers.
Society Naval Architects and Marine Engineers.
American Society of Civil Engineers.

The symbols adopted by the International Electrotechnical Commission were exhibited. It was pointed out that these

symbols are in universal use throughout the world by electrical engineers. It was agreed that this list should be adhered to by the present committee. The list of symbols for Mechanics and Hydraulics approved by the S. P. E. E. on June 28, 1918, was also discussed. It was agreed that this list be accepted as the starting point for the work of the Conference. This list may be changed later, if necessary, to receive general acceptance by all or nearly all of the societies. It was agreed that the work of the committee should cover symbols for heat, including steam and gases, mechanics, including statics, dynamics, kinematics, strength of materials and hydraulics, geometrical optics, physical chemistry and related branches. In each case the purely scientific, as well as the engineering side of the subject, should be covered.

It was agreed that a letter should be sent to each of the societies in the above list, including additions to be made by the chairman, inviting each society to participate in the work of the Conference and officially to appoint a delegate to represent it as soon as convenient. Each society is to be asked to send in a list or lists of symbols in common use in its own branch, prepared, either by a committee appointed expressly for that purpose, or by the delegate of the society to the Conference. Other interested persons are also to be asked to send lists of symbols. All of the lists are to be sent to the chairman of the Conference before February 1, in order that they may be compiled and charted for presentation at a meeting of the Conference which is to be called as soon thereafter as is feasible.

S. A. Moss,
Temporary Secretary.

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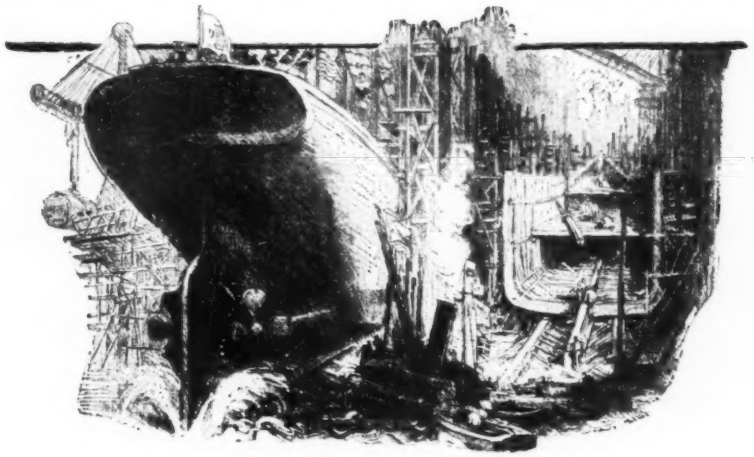

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